

# **Comparing Knowledge and practice of COVID-19 vaccination between general school (Grade 6 to 9) and madrasa-going students (Grade 6 to 9 equivalent) at Cox's Bazar, Bangladesh**

Final Report of Summative Learning Project (SLP) presented to the BRAC James P. Grant School of Public Health, BRAC University.

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## **Abstract:**

### **Background**

Schools and madrasas are regarded as high-risk locations for COVID-19 epidemics due to the crowded campus atmosphere, high movement, and constrained space. Therefore, vaccination is believed to be an essential tactic that can significantly reduce the occurrence and spread of this deadly infectious disease. However, there may be variations between a madrasa and a school regarding students' desire to receive the COVID-19 vaccination. Therefore, a study comparing knowledge and practice of COVID-19 vaccination between general school and madrasa-going students is essential to improve vaccine coverage and prevent a future outbreak.

### **Methods**

A cross-sectional quantitative survey was conducted on students from six schools and six madrasas in Bangladesh. A semi-structured and self-reported questionnaire containing informed consent, four sections containing the socio-demographics section, the impact of COVID section, knowledge about COVID vaccine section, and uptake of COVID vaccine was used. Multiple logistic regression was performed to determine the variables affecting the uptake of COVID-19 vaccinations.

### **Results**

A total of 2361 respondents were included in the final analysis, out of whom 1550 (65.65%) were school students and 811 (34.35%) were from the madrasa. The average age of students was  $13.74 \pm 1.41$  (SD), and more than half were females (64.00%). Both students from school and madrasa had adequate knowledge about the COVID-19 vaccine, and the proportion of madrasa students with correct answers was higher than that of school students. The common source of knowledge for school students was school; for madrasa students, it was mass media. There was more than 95% vaccine uptake for both institutions, and the primary reason for taking the vaccine was the perception that the vaccine was safe. Socio-demographic factors like age, family size, and location had a significant association with vaccine uptake.

## **Conclusions**

The findings reflect that there is no significant difference in uptake of the COVID vaccine between schools and madrasa. The proportion of madrasa students was higher than school students when asked about knowledge.

## **Introduction:**

The World Health Organization officially designated COVID-19 as a pandemic on March 11, 2020 (Cucinotta & Vanelli, 2020). SARS-CoV-2 is the virus that causes COVID-19 pandemic, which is distinguished by its high contagiousness as well as its widespread susceptibility (World Health Organization, 2022). As a direct consequence of this, COVID-19 transmission has reached a widespread population and has proven to be difficult to eradicate (Cui et al., 2020). COVID-19 has impacted more than two hundred countries and over six million people have lost their lives worldwide (WHO, 2022). More than 2 million people in Bangladesh were affected, and more than 30,000 people lost their lives as a direct result of the disaster (MIS -DGHS & IEDCR, 2022). This terrible circumstance was the driving force for the COVID-19 vaccination campaign (Our World in Data, 2022), and it has been demonstrated that vaccination can help prevent and control the disease through the successful production of vaccinations on a large scale and widespread vaccination campaigns (Hodgson et al., 2020). With that in mind, even though it usually takes years for a vaccine to reach the point where it can be used in people, researchers in the year 2020 raced against the clock to produce safe and effective coronavirus vaccines in as little time as possible. Several vaccines have been developed and licensed to use in the fight against COVID, with the Pfizer vaccine, Moderna, and AstraZeneca-Oxford having efficacy rates of 96%, 94.10%, and 70%, respectively (Business Insider, 2020). Following the development of the vaccines, numerous countries, including Bangladesh, began purchasing COVID-19 vaccinations as a preventative measure in order to protect their citizens. Initially, Bangladesh purchased 10 million vaccine doses of the COVISHIELD vaccine from the Serum Institute of India (SII) and imported them into the country (Md. E. Hossain et al., 2021). Later on, Bangladesh began the process of importing various vaccines, such as BioNTech, Moderna, Sinopharm, etc. Nevertheless, despite the ease of access to vaccines, ignorance and a pessimistic outlook were the root causes of vaccine hesitancy.

The definition of vaccine hesitancy can be "delaying or refusing immunization despite the availability of vaccination services." (Callaghan et al., 2021). Hesitancy toward vaccination is a common occurrence, and reluctance toward the COVID-19 vaccine has been documented in a number of countries (Callaghan et al., 2021; Caserotti et al., 2021; Lin et al., 2020). According to the findings of a study that looked at the potential acceptance of the COVID-19 vaccine on a

global scale, 48 percent of the study participants were unsure whether they would receive the COVID-19 vaccination or not because they were unclear about the vaccinations (Kalam et al., 2021). The findings of a number of studies conducted in the Czech Republic, Lebanon, Italy and Bangladesh (Bou Hamdan et al., 2021; Caserotti et al., 2021; Riad et al., 2021) show that sociodemographic factors, accessibility of vaccine, fear of side effects, a lack of knowledge may cause hesitancy. Additionally, in countries like Bangladesh, the United Arab Emirates, and Saudi Arabia, where schoolchildren are still young, the opinions and resistance of the children's parents play a significant role in determining whether or not these young children are vaccinated (Ali et al., 2022; Almalki et al., 2022; Kharaba et al., 2022; Olusanya et al., 2021). Hesitancy about getting vaccinated has a significant bearing on how many people actually get the vaccine. However, as of the month of October 2022, approximately 76% of Bangladesh's population had been successfully vaccinated (Institute for Health Metrics and Evaluation, 2022).

In the early days of the pandemic, the Bangladesh government imposed a nationwide lockdown on March 26, 2020 (M. S. Islam et al., 2021). Prior to that, on March 17, 2020, the government of Bangladesh made the decision to close all of the country's educational institutions (The Business Standard, 2020). Later, after initially purchasing vaccines, the government focused its immunization efforts on a small group of people like first-line medical personnel, officials from the public and private sectors engaged in pandemic issues, and people 40 and older (Kalam et al., 2021). However, to resume the educational institutes, the government rolled out a massive vaccination process in February 2022 for students aged 12 to 17 years old, and from August 2022, they focused on vaccinating children aged 5 to 11 years old (Anadolu Agency, 2022a). Because of the crowded campus atmosphere, the high volume of foot traffic, and the limited available space, the schools are considered to be high-risk locations for COVID-19 epidemics. In order to forestall the occurrence of further epidemics, it was necessary to immunize the students before they could return to their on-campus classes. However, there is no evidence that has been published regarding the knowledge and practice (vaccine uptake) of these young students with regard to COVID-19 vaccinations. There are no published articles regarding the level of COVID vaccination knowledge and uptake among primary (grades 1–5) and secondary (grades 6–10) students who attend either public or private educational institutions, primarily because they were the last group to take the vaccine (Kumar et al., 2021). Making the matter worse, there is

absolutely no published article regarding the COVID-19 vaccination knowledge and uptake of madrasa students.

Madrasa is an educational institute that does not follow mainstream academic guidelines and focuses mainly on Islamic studies (Hussain, 2018). There are two main types of Madrasa institutions, the Aliya Madrasa and the Qawmi Madrasa. The former is recognized by the Bangladesh government, while the latter does not follow the national curriculum and is still primarily unrecognized. They have a different outlook on vaccination, mainly depending on sharia law (Islamic law). Some Muslims are less likely to get vaccinated because they are concerned that vaccines and other pharmaceuticals may not be Halal, and they are concerned that they will be breaking Islamic law (Kabir et al., 2021). In Pakistan, after a false rumor spread that the polio vaccine causes sterilization and consists porcine products, uptake of the polio vaccine decreased, and Pakistan continues to see polio outbreaks still this date (Harapan et al., 2021). The results of a comparative study that was carried out in madrasas in Dhaka, Chittagong, and Rajshahi with a total of 600 students showed that approximately one-fifth of the students had no knowledge whatsoever regarding vaccination (Islam, 2016). However, approximately half of the students had some knowledge regarding vaccination (Islam, 2016). Additionally, there were approximately 7% of students who did not receive any vaccinations despite the fact that 65% of the students received vaccinations (Islam, 2016). In addition, when compared to students who attend public or private educational institutions, those who are educated in madrasas have the least fortunate circumstances in terms of educational opportunities and other aspects (Dhaka Tribune, 2018; Hussain, 2018). This shows that madrasa students' knowledge of vaccinations and their willingness to get vaccinated may be different from those of students attending general schools.

This survey looked into the student's knowledge of and usage of the COVID-19 vaccine as well as explored any differences in knowledge and uptake between school and madrasa-going students. Firstly, this was done in order to evaluate the current state of vaccine uptake and develop effective strategies to increase the vaccination coverage of COVID-19 among school-aged children. Secondly, this study also revealed if there's any difference between the uptake of vaccines between school and madrasa so that the government can come up with



specific focused strategies to address this difference. The results of this research could be helpful in developing health education messages to promote vaccination acceptability among students who have been hesitant to receive a new vaccine, as well as among larger populations in Bangladesh and other countries with people that are comparable to Bangladesh.

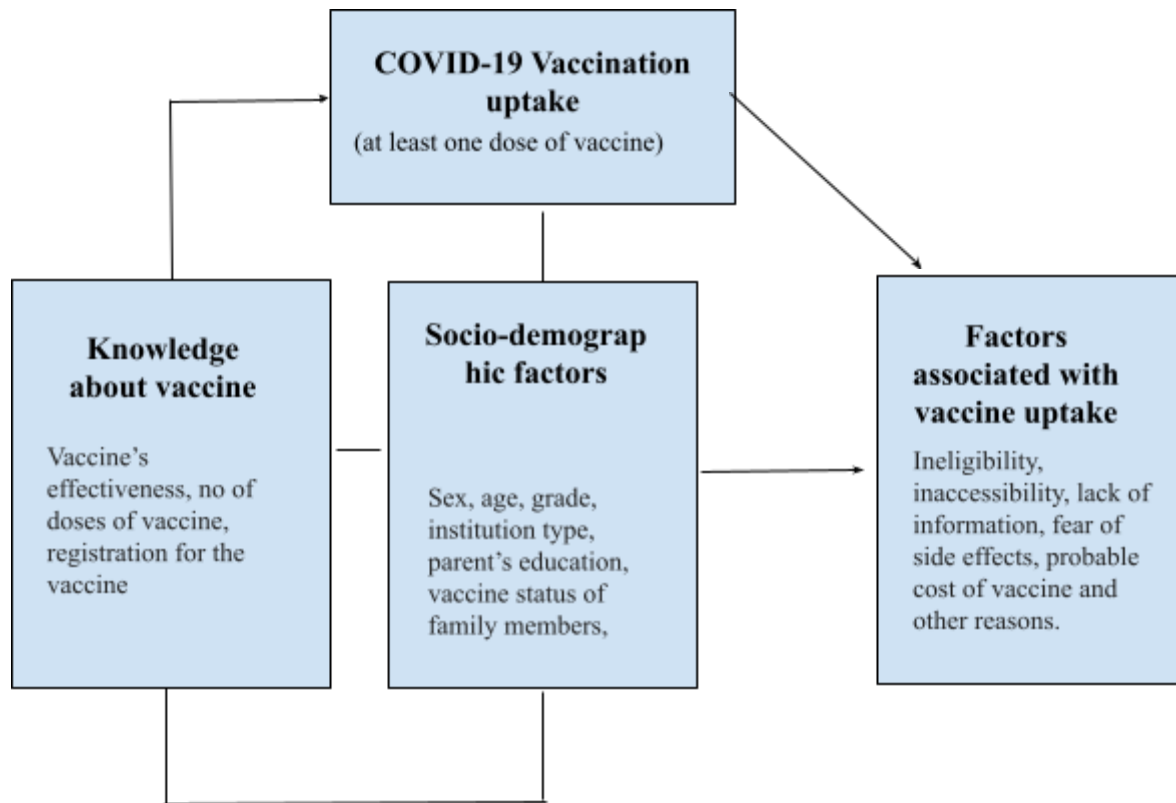
**Research question:**

Is there any difference in COVID-19 vaccination knowledge and practice between general school-going children (grades 6–9) and madrasa children (grades 6–9 equivalent) in Cox's Bazar Sadar and Pekua?

**Specific research question:**

1. What is the COVID-19 vaccination knowledge among general school (grades 6–9) and madrasa-going students (grades 6–9 equivalent) at Cox's Bazar Sadar and Pekua?
2. What is the COVID-19 vaccine uptake rate among general school (grades 6–9) and madrasa-going students (grades 6–9 equivalent) at Cox's Bazar Sadar and Pekua?
3. What are the differences in COVID vaccination knowledge and uptake among general school (grades 6–9) and madrasa-going students (grades 6–9 equivalent) at Cox's Bazar Sadar and Pekua?
4. What sociodemographic factors are associated with vaccine uptake among general school (grades 6–9) and madrasa-going students (grades 6–9 equivalent) at Cox's Bazar Sadar and Pekua?

**Conceptual framework:**



### **Methodology:**

This study was part of a larger project by the BRAC James P. Grant School of Public Health. This was a multi-stage project; where in the first stage, according to mask distribution, they divided the Cox's Bazar district into two areas: high-performing areas (3 subdistricts) and low-performing areas (3 subdistricts). From both areas, they randomly selected one subdistrict, Pekua from the high-performing area and Cox's Bazar Sadar from the low-performing area. In the second stage, they again randomly selected three unions from each subdistrict. In the third stage, they chose one school and one madrasa at random from each union for both subdistricts. So, they have three schools and three madrasas from Pekua and 3 schools and 3 madrasas from Cox's Bazar Sadar.

### **Study design:**

A cross-sectional and quantitative study was conducted among school and madrasa-going students.

**Study site:**

The study was conducted at six general schools and six madrasas at Cox's Bazar Sadar and Pekua Upazila in Bangladesh, where the BRAC CST intervention project was being implemented. The schools and madrasas were randomly selected.

Cox's Bazar Sadar is located 150 kilometres south of Chittagong. According to the Bangladesh national portal, the total population of Cox's Bazar Sadar is 5,22,435 people. The literacy rate is 49.02%. At the same time, Pekua is an upazila of Cox's Bazar district with a population of 1,71,538 and a literacy rate of 50.01%.

**Study population:**

The study population was all students studying in grades 6 to 9 and their equivalents in those preselected schools and madrasas. Students who were absent during data collection were excluded.

**Sampling strategy and sample size:**

There is no existing literature or evidence about vaccination knowledge among school-going students. However, at the baseline, 77% of schoolchildren were aware that vaccination could prevent the spread of the virus. We are assuming there will be a 5% difference between madrasa and school-going students, which is a very small expected difference, so that we can take a larger sample size, reducing the possibility of error.

$$N = 2 \cdot [z_{\text{crit}} \sqrt{2\bar{p}(1 - \bar{p})} + z_{\text{pwr}} \sqrt{p_1(1 - p_1) + p_2(1 - p_2)}]^2 / D^2$$

Here,

$D = p_1 - p_2$  (i. e, the minimum expected difference),

$\bar{p} = (p_1 + p_2) / 2$

$N$  = total sample size

$Z_{\text{crit}} = 1.96$  at 95% C.I and  $Z_{\text{pwr}} = 0.84$  at 80% power

$p_1$  = Proportion (knowledge among school-going children) (0.77)

$p_2$  = Proportion

(knowledge among madrasa-going students) (0.72)

Thus,  $N$  is calculated as 2384 (1192 for school and 1192 for madrasa).

But since this is part of a larger project by BRAC, census sampling was used, where we took data from all available students from grades 6 to grade 9 studying in those institutions.

### **Study tools:**

A pre-structured quantitative questionnaire was developed for this study. The questionnaire had four different sections with a total of 33 questions (including 14 for sociodemographic, 7 for knowledge, and 12 for practice). The questionnaire included single- and multiple-choice questions.

Initial section had socio-demographic information for example age of the students, gender of the students, the grade (grade 6 to 9) of the student, type and name of institutions, level of education of parents, household family size, and location were considered (Table 1)

In the second section, the students were asked if they have ever been diagnosed with COVID-19 or if any adults living with them have been diagnosed with COVID-19. The third and fourth sections contained questions regarding knowledge (7 questions). and practice (12 questions).

A questionnaire was developed in English. It was then translated into the local language, Bengali. The Bengali version was translated back into English, and the accuracy of the translation was evaluated by contrasting the two versions. The questionnaire underwent pretesting prior to data collection. Based on the findings of the tests, certain adjustments were made.

### **Data collection procedure:**

Two data field collection coordinators appointed by the BRAC JPGSPH project team visited the schools one week prior to the data collection. They contacted the school and madrasa authorities and obtained consent from the teachers. As we are students at JPG and our selected institutions are far from Dhaka, we trained the data collectors in collaboration with the BRAC James P Grant School of Public Health project about the research. Then they visited those pre-selected schools and madrasas with a pre-structured questionnaire and gave the questionnaire and assent form to the students, where they explained the objective of the study and gave relevant instructions. They filled out the paper-based forms by themselves, and the data collectors collected the forms. Finally, the data collectors collected data from 3074 students.

## **Study variables:**

**Outcome variable:** knowledge and uptake of the COVID-19 vaccine among school and madrasa-going students

**Knowledge:** knowledge was assessed by questions regarding COVID-19 vaccination, the source of information, how many doses are required, the registration procedure, and knowledge regarding the effectiveness of the vaccine.

**Practice:** Practice was assessed by the uptake of at least one dose of the COVID-19 vaccine of any kind. We investigated the factors that influence vaccine uptake and if they did take the vaccine, the reasons for doing so. And if they didn't take the vaccine, what are the reasons behind it. In addition, the uptake status of siblings and any adults living with them was checked.

**Explanatory variable:** sociodemographic variables like sex, age, grade, institution type, upzilla, number of household members, parents' education, vaccination status of parents, and whether the parents or participants have ever been affected by COVID-19.

## **Data management and analysis plan:**

Data from the questionnaire was entered into the Survey CTO platform. It was cleaned and filtered by cross-checking with the paper-based questionnaire to ensure that no variable was missed before the analysis. The data were analyzed and interpreted using STATA 17. The results are shown in a table with means and standard deviations for categorical variables and counts, and percentages for continuous variables. The t-test (for numerical data) and chi-square test (for categorical variables) were used to compare general school and madrasa children. Furthermore, an adjusted multivariate logistic regression analysis was conducted to determine predictors of vaccine uptake based on the respondents' demographics. Results are expressed as odds ratios (ORs) accompanied by 95% confidence intervals (95% CIs), and a  $p$ -value  $< 0.05$  was used as the threshold for statistical significance.

## **Ethical Consideration**

Ethical approval for this study was obtained from the Ethical Review Committee of the BRAC James P Grant School of Public Health, BRAC University. Consent was obtained from the immediate guardians, and assent in writing was obtained from the participants. All study participants were informed about their research involvement, objectives, and duration. Participants' anonymity and privacy were protected during data collection and the dissemination of study results. Participants' participation was voluntary, and they could withdraw anytime.

## **Results:**

### **Sociodemographic and other information of the respondents:**

The socio-demographic characteristics of the study participants are listed in Table 1. A total of 2361 respondents were included in the final analysis, of whom 1550 (65.65%) were school students and 811 (34.35%) were from the madrasa. The average age of students was  $13.74 \pm 1.41$  (SD) years old (ranging from 10 to 18); more than half were female; 1511 (64.00%), 642 (27.19%) were in Class 8 and equivalent. The majority of their parents never went to school/madrasa or studied less than class 5 {father: 1,024 (43.37%) and mother: 892 (37.78%)}. They had an average number of  $5.68 \pm 2.00$  (SD) household members; among them, the average number of siblings was  $3.78 \pm 1.89$  (SD). Most students have never been diagnosed with COVID-19 (86.04%), and almost all (83.90%) of the adults living with them have never been diagnosed with COVID-19. Finally, most of the students were from Pekua Upzilla, which had 1,481 students (62.73%).

*Table 1 Socio-demographic and other information of the participants:*

<b>Socio- demographics and others</b>	<b>Overall N = 2361</b>	<b>School going students N =1550</b>	<b>Madrasa going students N= 811</b>	<b>P - value</b>
<b><u>Age {Mean [SD]}</u></b>	13.74 (1.41)	13.68 (1.33)	13.86 (1.54)	0.004
<b><u>Gender</u></b>				
Male	850 (36.00)	637 (41.10)	213 (26.26)	0.00
Female	1511 (64.00)	913 (58.90)	598 (73.74)	
<b><u>Grade</u></b>				
Class 6 and equivalent	579 (24.52)	336 (21.68)	243 (29.96)	0.00
Class 7 and equivalent	580 (24.57)	411 (26.52)	169 (20.84)	
Class 8 and equivalent	642 (27.19)	425 (27.42)	217 (26.76)	
Class 9 and equivalent	560 (23.72)	378 (24.39)	182 (22.44)	
<b><u>Education of Father</u></b>				

Never went / less than class 5/ student didn't know	1,024 (43.37)	634 (40.90)	390 (48.09)	0.00
Finished class 5	528 (22.36)	329 (21.23)	199 (24.54)	
Finished class 10	435 (18.42)	279 (18.00)	156 (19.24)	
Studied until college	150 (6.35)	120 (7.74)	30 (3.70)	
Studied more than college	224 (9.49)	188 (12.13)	36 (4.44)	
<b><u>Education of Mother</u></b>				
Never went / less than class 5/ student didn't know	892 (37.78)	547 (35.29)	345 (42.54)	0.00
Finished class 5	497 (21.05)	308 (19.87)	189 (23.30)	
Finished class 10	669 (28.34)	452 (29.16)	217 (26.76)	
Studied until college	156 (6.61)	130 (8.39)	26 (3.21)	
Studied more than college	147 (6.23)	113 (7.29)	34 (4.19)	
<b><u>Household member number</u></b> {Mean [SD]}	5.68 (2.00)	5.56 (2.06)	5.91 (1.86)	0.00
<b><u>Total number of siblings</u></b> {Mean [SD]}	3.78 (1.89)	3.7 (1.92)	3.94 (1.83)	0.004
<b><u>Have you ever been diagnosed with COVID-19?</u></b>				
No	2,010 (86.04)	1,286 (84.55)	658 (82.66)	0.241
Yes	326 (16.10)	235 (15.45)	138 (17.34)	
<b><u>Has any adult who lives with you have ever been diagnosed with COVID - 19?</u></b>				
No	1,944 (83.90)	965 (81.57)	488 (82.02)	0.0422
Yes	373 (14.62)	170 (14.37)	90 (15.13)	
<b><u>Upzilla</u></b>				
Cox's Bazar Sadar	880 (37.27)	405 (26.13)	475 (58.57)	0.00

Pekua	1,481 (62.73)	1,145 (73.87)	336 (41.43)	
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**Distribution of school and madrasa:**

According to the pie chart in Figure 1, among the 6 schools, the highest number of students (37.23%) were from Pekua Govt. GMC Institute. Among the 6 madrasas, the highest number of students (26.26%) were from PM Khali Adarsha Dhakhil Madrasa.

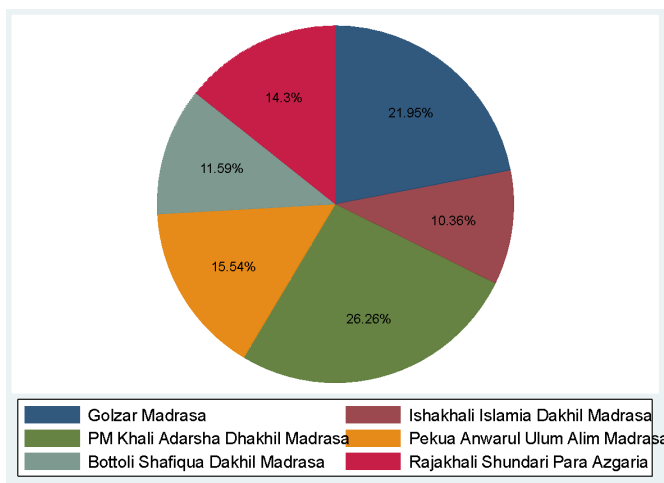


Figure 1 Distribution of schools

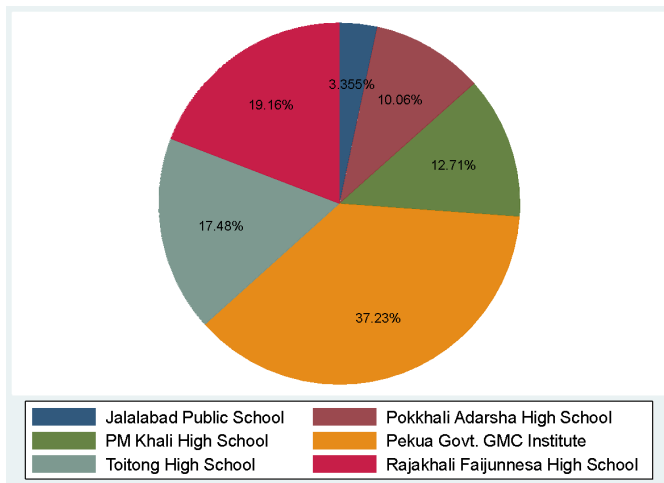


Figure 2 Distribution of madrasas



## **Knowledge about COVID Vaccine:**

The distribution of participant responses to each knowledge question is shown in Table 2 with institute difference. We asked seven questions to assess the student's knowledge about COVID-19 vaccination. In general, the students' reported responsiveness shows that most of them had heard about COVID-19 vaccination ( $n = 2336$ ). When asked about the source of COVID-19 information, the differences were found to be significant between the responses of the school and madrasa-going students. Among the sources, the majority cited school as their primary source. This response was given significantly more by school students. The second major source was TV news, which was significantly more common among madrasa students compared to school students (60.54% and 69.92%, respectively;  $p = 0.00$ ). The other two major sources were newspapers (54.11%) and family members (48.39%); approximately the same proportion of school and madrasa students mentioned these sources. Whereas, the other two common sources were social media (28.53%) and cell phones (21.31%), where the proportion was significantly higher among madrasa students than school students (31.53% and 22.91%, respectively;  $p = 0.0$ ) and (25.46% & 19.19%, respectively;  $p = 0.005$ ).

When asked, "How many doses are required for proper vaccination?" the majority reported, "Three doses" (76.20%). This response was given significantly more by Madrasa students. Most students (88.31%) replied "Yes" when asked, "Do you know how to register for a vaccine?" When compared to Madrasa students, this reaction was significantly much higher in schools (89.72% and 85.61%, respectively;  $p = 0.003$ ). More than half of the students (60.0%) answered online registration as the source of registration. Most of the students (89.95% of 2,288 students) replied "Yes" to the statement "COVID vaccine stops the spread of the virus," and approximately the same proportion of school and madrasa students (89.60% and 90.63%) mentioned this response. On the other hand, most of the students replied "Yes" to the statement that "the vaccine reduces virus-related death." This response was significantly higher in madrasa students than in school students (86.56% and 81.24%, respectively;  $p = 0.001$ ).

*Table 2 Knowledge about the COVID Vaccine:*

<b>Knowledge about COVID Vaccine</b>	<b>Overall N = 2361</b>	<b>School going students N =1550</b>	<b>Madrasa going students N= 811</b>	<b>P - value</b>
<b><u>Have u heard about covid vaccine</u></b>				
No	25 (1.06)	13 (0.84)	12 (1.48)	0.148
Yes	2336 (98.94)	1537 (99.16)	799 (98.52)	
<b><u>What is the source of COVID info?</u></b>	2336	1537	799	
Newspaper	1211 (54.11)	774 (52.30)	437 (57.65)	0.143
TV News	1426 (63.72)	896 (60.54)	530 (69.92)	0.000
Social Media	578 (28.53)	339 (22.91)	239 (31.53)	0.000
Cellphone	477 (21.31)	284 (19.19)	193 (25.46)	0.005
School	1599 (71.45)	1128 (76.22)	471 (62.14)	0.000
Friends	845 (37.76)	527 (35.61)	318 (41.95)	0.30
Family Members	1083 (48.39)	690 (46.62)	393 (51.85)	0.173
Neighbors	838 (37.44)	535 (36.15)	303 (39.97)	0.691
Government directed campaign	626 (27.97)	434 (29.32)	192 (25.33)	0.417
<b><u>How many doses required for proper vaccination?</u></b>				
One dose	81 (3.47)	52 (3.38)	29 (3.63)	0.002
Two doses	352 (15.07)	256 (16.66)	96(12.02)	
Three doses	1780 (76.20)	1143 (74.37)	637 (79.72)	
more than three doses	74 (3.17)	45 (2.93)	29 (3.63)	
Don't know	49 (2.10)	41 (2.67)	8 (1.00)	
<b><u>Do you know how to register for vaccine?</u></b>				
No	273 (11.69)	158 (10.28)	115(14.39)	0.003
Yes	2063 (88.31)	1379 (89.72)	684 (85.61)	
<b><u>Source of registration</u></b>				
Hospital	775 (37.80)	529 (38.61)	246 (36.18)	1.00
Pharmacy	119 (5.80)	79 (5.77)	40 (5.88)	1.00

School	730 (35.61)	520 (37.96)	210 (30.88)	0.007
Online registration	1230 (60.00)	824 (60.15)	406 (59.71)	1.00
<b><u>COVID vaccine stops spread of virus</u></b>				
Yes	2058 (89.95)	1352 (89.60)	706 (90.63)	0.436
No	230 (10.05)	157 (10.40)	73 (9.37)	
<b><u>The vaccine reduces the virus-related death</u></b>				
No	391 (16.93)	284 (18.76)	107 (13.44)	0.001
Yes	1919 (83.07)	1230 (81.24)	689 (86.56)	

**Uptake:**

The distribution of participant responses to each practice question is shown in Table 3 and Figure 3. Around 96.84% of students in school and 96.05% of students in madrasas have taken the vaccine.

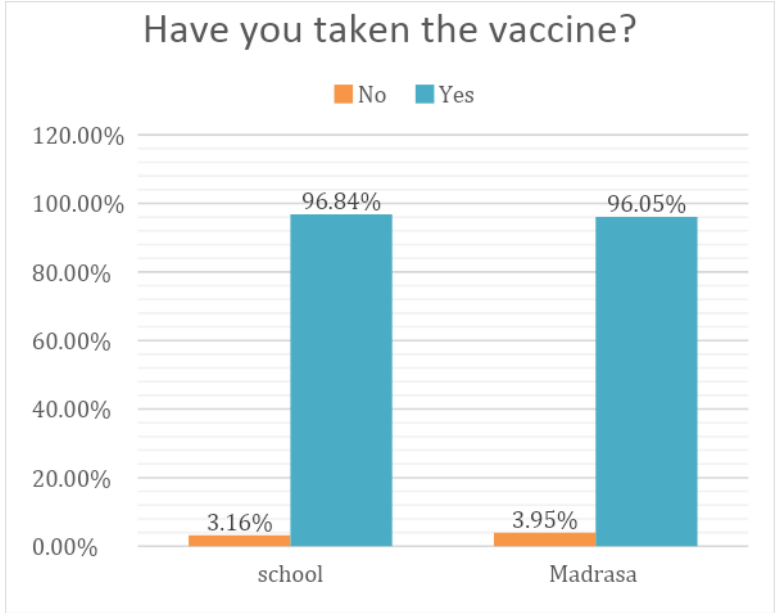


Figure 3 Vaccine uptake of students - school vs madrasa

Most of them have taken 2 doses of the vaccine (85.66% of all students). This response was significantly higher in school students than in madrasa students (87.81% and 81.51%, respectively;  $p = 0.001$ ). Most of the school students took the vaccine from the hospital (64.24%), and the majority of the madrasa students took the vaccine from the madrasa (54.74%), and this difference is statistically significant ( $P < 0.05$ ).

When asked about what motivated them to take the vaccine, more than half (68.35%) responded that they thought vaccines were safe. This response was significantly higher in madrasa students than in school students (73.17% and 65.89%, respectively;  $p = 0.005$ ). Similarly, “Yes” response was significantly higher in Madrasa students (61.69% vs. 47.77% schools,  $p = 0.00$ ) to “Because the government says so”, to “Because of the advice of relatives/ friends” (31.95% vs. 20.31% schools,  $p = 0.00$ ), to “Organizing group vaccinations at school” (36.10% vs. 30.08% schools,  $p = .038$ ) and to “Vaccines being free of charge” (27.94% vs 19.11%,  $p = 0.00$ )

When asked about why they didn't take the vaccine, more than half (59.09%) responded that “I am not eligible for the vaccine,” followed by “I am afraid of the needle” (29.55%) and “I don't know about the vaccine” (27.27%).

*Table 3 Vaccine uptake of students*

<b>Vaccine uptake of students</b>	<b>Overall N = 2280</b>	<b>School going students N = 1501</b>	<b>Madrasa going students N= 779</b>	<b>P - value</b>
<b><u>how many doses of vaccine did you take?</u></b>				
One dose	123 (5.39)	69 (4.60)	54 (6.93)	0.001
Two doses	1953 (85.66)	1318 (87.81)	635 (81.51)	
Three doses	18 (0.79)	9 (0.60)	9 (1.16)	
Student didn't respond	186 (8.16)	105 (7.00)	81 (10.40)	
<b><u>From where did you take the vaccine?</u></b>				
School/Madrasa	917 (41.83)	513 (35.28)	404 (54.74)	0.00
Hospital	1262 (57.57)	934 (64.24)	328 (44.44)	
Pharmacy	12 (0.59)	7 (0.48)	6 (0.81)	
<b><u>What motivated you to take the vaccine?</u></b>				
Because government says so	1121 (52.48)	675 (47.77)	446 (61.69)	0.00

Because of the advice of relatives/ friends	518 (24.25)	287 (20.31)	231 (31.95)	0.00
I think vaccines are safe	1460 (68.35)	931 (65.89)	529 (73.17)	0.005
I am worried about COVID 19 Infection	692 (32.40)	443 (31.35)	249 (34.44)	1.00
Organizing group vaccinations at school	686 (32.12)	425 (30.08)	261 (36.10)	0.038
People around having been vaccinated	423 (19.80)	252 (17.83)	171 (23.65)	0.011
Vaccines being free of charge	472 (22.10)	270 (19.11)	202 (27.94)	0.00
Don't know	94 (4.40)	64 (4.53)	30 (4.15)	1.00
<b><u>Why didn't you take the vaccine?</u></b>				
I don't know about the vaccine	12 (27.27)	8 (26.67)	4 (28.57)	1.00
COVID-19 is curable and cannot cause serious damage	3 (6.82)	2 (6.67)	1 (7.14)	1.00
Vaccine is not effective against COVID	2 (4.55)	0	2 (14.29)	0.375
Vaccine has side effects	4 (9.09)	2 (6.67)	2 (14.29)	1.00
I am not eligible for the vaccine	26 (59.09)	18 (60.00)	8 (57.14)	1.00
I am afraid of the needle	13 (29.55)	10 (33.33)	3 (21.43)	1.00
Vaccine is costly	4 (9.09)	3 (10.00)	1 (7.14)	1.00
I don't know where to get the vaccine form	7 (15.91)	5 (16.67)	2 (14.29)	1.00
The vaccination hospitals being far away	2 (4.55)	1 (3.33)	1 (7.14)	1.00
My parents do not allow me to get the vaccine	3 (6.82)	2 (6.67)	1 (7.14)	1.00
Most of the people around are not vaccinated	2 (4.55)	1 (3.33)	1 (7.14)	1.00

Around 89.9% and 89.37% of the siblings and adults living with respondents, respectively, took the COVID vaccine. Among the adults, mothers (92.53%), followed by fathers (90.52%), are the top ones to take the vaccine. When asked the reason behind adults not taking the vaccine, most

of the students responded, “I don't know” (56.41%) and also, “There are side effects of taking the vaccine” (23.08%).

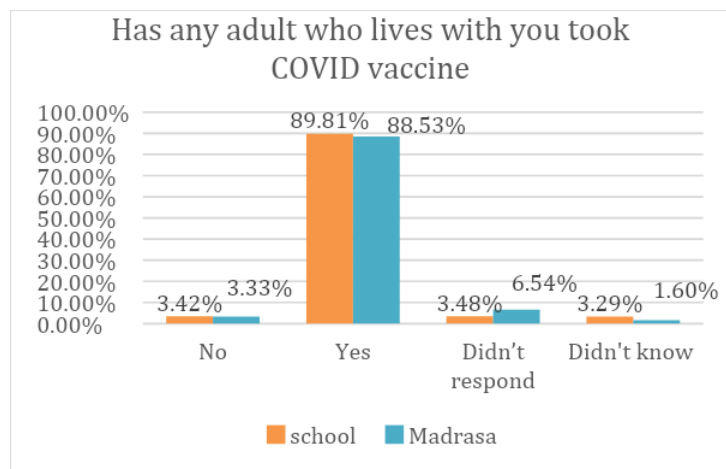


Figure 4 Vaccine uptake of family members

Table 4 vaccine uptake of family members

Vaccine uptake of family members	Overall N = 2361	School going students N =1550	Madrasa going students N= 811	P - value
Number of brothers {Mean [SD]}	1.96 (1.46)	1.92 (1.44)	2.02 (1.47)	0.116
Number of sisters {Mean [SD]}	1.82 (1.47)	1.77 (1.52)	1.91 (1.38)	0.031
<b><u>Did your siblings take the vaccine?</u></b>	2,233	1,478	755	
No	331 (14.82)	207 (14.01)	124 (16.42)	0.428
Yes	1829 (81.91)	1223 (82.75)	606 (80.26)	
Student didn't respond	40 (1.79)	25 (1.69)	15 (1.99)	
Don't know	33 (1.48)	23 (1.56)	10 (1.32)	
<b><u>How many of your brothers took the vaccine?</u></b>	1829	1223	606	
{Mean [SD]}	1.77 (1.47)	1.77 (1.49)	1.74 (1.42)	0.73
<b><u>How many of your sisters took the vaccine?</u></b> {Mean [SD]}	1.66 (1.38)	1.61 (1.37)	1.77 (1.38)	0.022

<b><u>Who's the adult who has taken the vaccine?</u></b>				
Father	1842 (90.52)	1224 (91.14)	618 (89.31)	0.906
Mother	1883 (92.53)	12242 (92.44)	640 (92.49)	1.00
Sister	1422 (69.88)	911 (67.83)	511 (73.84)	0.026
Brother	1366 (67.13)	884 (65.82)	482 (69.65)	0.407
Grandfather/grandmother	835 (41.03)	600 (44.68)	235 (33.96)	0.00
<b><u>Among those who haven't taken the vaccine, why haven't they taken it?</u></b>				
There are side effects of taking the vaccine	9 (23.08)	4 (13.79)	5 (50.00)	0.115
COVID vaccine is expensive	4 (10.26)	0 (0.00)	4 (40.00)	0.002
COVID-19 is curable and cannot cause serious damage	7 (19.95)	4 (13.79)	3 (30.00)	1.00
Don't know about COVID vaccine	8 (20.51)	4 (13.79)	4 (40.00)	0.461
Vaccination centers are far away	6 (15.38)	3 (10.34)	3 (30.00)	0.824
I don't know	22 (56.41)	18 (62.07)	4 (40.00)	1.00

### **Factors affecting uptake in school and madrasa:**

In terms of respondents' vaccine uptake according to their demographic and knowledge variables, the principal factor analysis demonstrated that the key factors were the respondents' age ( $p = 0.000$ ), family size ( $p = 0.04$ ), their knowledge about doses required for vaccination ( $p = 0.03$ ), and knowledge about vaccine registration ( $P = 0.05$ ). Geographical differences were also discovered to have a substantial impact on vaccine uptake ( $p = 0.000$ ). There is no significant difference between schools and madrasas in terms of vaccine uptake.

The analysis showed that, as the respondents' ages increased, the level of vaccine uptake increased. As their age increased, they had 147% more odds of taking the vaccine compared to

those of a younger age (OR = 2.47, CI = 2.039–2.99, p = 0.00). In terms of family size, if the family size is above 4, they had 60% lower odds of taking the vaccine than the families who had less than 4 family members (OR = 0.40, CI = 0.17–0.98, p = 0.04). Also, those who had knowledge of how many doses of vaccine are required for proper vaccination had 177% more odds of taking the vaccine than those who didn't know about how many doses are required (OR = 2.77, CI = 1.08–7.08, p = 0.03). Those living in Pekua had 1104% more odds of taking the vaccine than those who lived in Cox's Bazar Sadar (OR = 12.04, CI = 5.07 - 28.55, p = 0.00).

Table 5 Factors affecting uptake in school and madrasa

	<u>Unadjusted</u>			<u>Adjusted</u>		
	<u>Odds ratio</u>	<u>P - value</u>	<u>95% confidence interval</u>	<u>Odds ratio</u>	<u>P - value</u>	<u>95% confidence interval</u>
<b>Age</b>	2.27	0.00	1.87 - 2.75	2.47	0.00	2.039 - 2.99
<b>Gender</b>						
Male	Ref	Ref	Ref	Ref	Ref	Ref
Female	0.05	0.843	-0.41 - 0.51	1.28	0.54	0.58- 2.81
<b>Family size</b>						
Equal or less than four	Ref	Ref	Ref	Ref	Ref	Ref
Above four	-0.76	0.043	-1.50 - (-0.02)	0.40	0.04	0.17 - 0.98
<b>Education of father</b>						
Finished class 5 and above	Ref	Ref	Ref	Ref	Ref	Ref
Finished class 5 and below	0.04	0.86	-0.43 - 0.51	0.94	0.91	0.31 - 2.88
<b>Education of mother</b>						
Finished class 5 and above	Ref	Ref	Ref	Ref	Ref	Ref
Finished class 5 and below	-0.40	0.08	-0.84 - 0.04	0.61	0.21	0.29 - 1.31
<b>No of siblings</b>	0.10	0.113	-0.02 - 0.22	1.16	0.11	0.97 - 1.40
<b>Upazila</b>						
Cox's bazar	Ref	Ref	Ref	Ref	Ref	Ref



Pekua	1.91	0.00	1.37 - 2.45	12.04	0.00	5.07 - 28.55
<b><u>Student diagnosed with COVID</u></b>						
Yes	Ref	Ref	Ref	Ref	Ref	Ref
No	0.39	0.30	-0.35 - 1.13	0.95	0.87	0.49 - 1.81
<b><u>Adult diagnosed with COVID</u></b>						
Yes	Ref	Ref	Ref	Ref	Ref	Ref
No	0.69	0.081	-0.09 - 1.48	1.67	0.18	0.80 - 3.49
<b><u>Do you have any idea how many doses are required for proper vaccination?</u></b>						
No	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1.05	0.00	0.44 - 1.67	2.77	0.03	1.08 - 7.08
<b><u>Do you know how to register for the vaccine?</u></b>						
No	Ref	Ref	Ref	Ref	Ref	Ref
Yes	0.89	0.00	0.35 - 1.44	2.30	0.05	1.00 - 5.27
<b><u>Knowledge about the vaccine reduces the virus-related death.</u></b>						
Don't know	Ref	Ref	Ref	Ref	Ref	Ref
Know	0.39	0.16	-0.15 - 0.92	1.40	0.08	0.96 - 2.05
<b><u>Institution type</u></b>						
School	Ref	Ref	Ref	Ref	Ref	Ref
Madrasa	-0.23	0.32	-0.68 - 0.22	1.57	0.42	0.53 - 4.63

Discussion:

The purpose of this study was to compare the level of COVID-19 vaccination knowledge and practice among Bangladeshi students in madrasas and schools. This is the first study that compares vaccination knowledge and practice among students in schools and madrasas, to the best of our knowledge. According to the results of our study, almost all of the students in both schools and madrasas had heard of the COVID vaccination and were adequately informed about it. Students at the madrasa and at the school learned this information in various ways. Madrasa students were more likely to rely on the media for their information. More than 95% of school and madrasa students had taken two doses of the vaccine. The reason for receiving the vaccine differed between schools and madrasas. Socio-demographic factors (age, family size, and knowledge about vaccination) were associated with vaccine uptake.

Our study showed that school students learned most of what they knew from school, while madrasa students learned most of what they knew from TV news. The other major sources were mass media, social media, and educational institutions. This is also similar to findings in (Farhana, 2020; Hossain et al., 2021), which showed that a vast majority of youth in Bangladesh learned about the COVID-19 vaccination mostly through social networking sites. However, surprisingly, a higher percentage of madrasa students depended on social media and cell phones than school students. The finding is contradictory since studies revealed that madrasa students had lower access to ICT devices and the internet (MOVE Foundation, 2019). This may be due to the fact that, during COVID, due to the closure of madrasas, students spent much time at home and had access to ICT devices and the internet. On the other hand, schools and madrasas played a huge role in disseminating information about COVID vaccination. This shows that the Bangladesh government can use educational institutes and social media to provide concise educational programs and to disseminate accurate knowledge among students for better reach.

Both madrasa and school students had a good understanding of COVID vaccination. Madrasa students were more likely to know the right answer than school students regarding the right doses and how well vaccinations work to reduce deaths caused by viruses. This differs from a study done among madrasa students, who had minimal knowledge about vaccination (Islam, 2016). This is likely because madrasa students at present are more open to information over social media, which may have contributed to their learning.

Our study revealed that more than 95% of students from school and madrasa had taken the vaccine; there is no significant difference between school and madrasa. This is surprising because madrasas teach Islamic studies and follow Sharia law. A study in Bangladesh found that some Muslim people worry about whether or not vaccines are Halal, so people are less inclined to receive vaccinations (Kabir et al., 2021). However, it is possible that the uptake rate in Bangladesh is higher because people's preferences about accepting COVID-19 vaccines are influenced by a variety of factors. Furthermore, all fatwas' councils agree that vaccines are required due to the pandemic. This means that getting a COVID-19 vaccination is a way to follow Sharia law (Mardian et al., 2021). Even so, the number of madrasa students who get two doses of the vaccine is lower than the number of school students who do so. The government should focus on encouraging madrasa students to take proper doses of vaccine.

Our study showed that the primary reason for taking the vaccine was that the students thought the vaccines were safe. However, many studies (Hossain et al., 2021; Islam et al., 2021; Wang et al., 2020) found that worries about the vaccine's effectiveness and safety as well as potential side effects are the main reasons why people around the world do not want to get vaccinated. However, this may not have influenced vaccine uptake among the students. It is probably because after information about its safety and effectiveness was made public, the amount of opposition to the COVID-19 vaccine decreased. Other major reasons for taking the vaccine were government decree, group vaccinations at institutions, and the vaccine being free of charge. This is similar to a study that found that students prefer on-site mass vaccination (Jiang et al., 2021). Also, according to (Kabir et al., 2021), 95% of participants said that Bangladeshi citizens should not be charged for the immunization. This is inconsistent with previous studies conducted in Indonesia, the US, and Ecuador, where the majority of respondents indicated that they would pay for the COVID-19 vaccine (Harapan et al., 2020; Sarasty et al., 2020; Wong et al., 2020). Bangladesh's financial situation, which was made worse by the fact that many people lost their jobs during COVID-19 lockdowns and quarantines, may account for this distinction from other countries. These things also led to unemployment, hunger, starvation, and social unrest. Because of this, many people could not afford the COVID-19 vaccine, and the fact that it was free may have helped a higher percentage of people get the vaccine. Also, since the government made vaccination mandatory for students for on-campus classes (Anadolu Agency, 2022b) the

vaccination uptake is high. These responses were significantly higher in Madrasa students than in school students.

Also, the main reasons people did not get the vaccine were that they did not meet the requirements or did not know about the vaccine. This shows there might still be gaps in knowledge among students about who can take the vaccine. They also revealed that around 30% of students did not want to take the vaccine because they were afraid of the needle, which is similar to findings found by Freeman et al., 2021, where they discovered that hesitation to receive the COVID-19 vaccine in adults may be caused in about 10% of cases by a fear of needles, and it is higher in case of children. So alternative needle-free approaches should be taken to improve vaccination uptake.

In the multiple logistic regression analyses, socio-demographic variables like older age, having a family size equal to or less than 4, knowing about the COVID vaccine, and the geographic area was associated with more positive attitudes regarding vaccination uptake. Surprisingly, previously being diagnosed with COVID or having any family member being affected by COVID did not have any significant association with vaccination uptake. In contrast, studies done in Bangladesh, Saudi Arabia, and France (Kabir et al., 2021; Ruiz & Bell, 2021; Ward et al., 2020) found that people who have already been diagnosed with COVID-19 are more likely to get the vaccine than those who have not.

People who knew more about the COVID vaccine were significantly more likely to get the vaccine. Similar results were found in another study in Bangladesh (Mahmud et al., 2021). Families with fewer than four members were more likely to get vaccinated, whereas families with more than four members were less likely to get vaccinated. At the same time, another study in Bangladesh showed that family size has no significant association with receiving the vaccine (Kamal et al., 2021). Students in Pekua, which is more rural than Cox's Bazar Sadar, were more prone to taking the vaccine than those in Cox's Bazar Sadar. This is similar to findings where people from rural areas had more knowledge about COVID vaccination (Ferdous et al., 2020). On the other hand, some studies (Hossain et al., 2020) have found a strong link between COVID-19 knowledge and urban areas.

## **Limitations:**

There are a few limitations on this study. First, a cross-sectional design was used for this study. As a result, drawing a causal conclusion may be impossible. Second, self-reporting has numerous limitations, including multiple biases, when compared to face-to-face interviews. Third, due to time constraints and student absences, data from all students could not be collected. Fourth, we asked only a few questions to assess the participants' level of practice and knowledge. Furthermore, more in-depth interviews are required for an accurate assessment of practices and the reasons for different perceptions of COVID vaccine uptake. More research is required to investigate the changes in vaccination intention and its determinants during the pandemic. Fifth, because this study was conducted in a smaller region of Bangladesh, the data cannot be generalized to the national level.

## **Conclusion:**

This study compared the COVID-19 vaccination knowledge and uptake between schools and madrasas. In madrasa, the proportion of students with correct knowledge was higher than in school. The COVID-19 vaccination uptake was very high, and there was no significant difference in vaccine uptake. However, more attention should be given to Cox's Bazar Sadar and developing a needle-free alternative for younger students. Also, a follow-up should be taken for those who have not completed the entire dose regime.

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